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A LIVABLE ENVIRONMENT FOR WILDLIFE IS QUALITY ENVIRONMENT FOR MAN

Montana Outdoors

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The irridescent green head bordered by a conspicuous white neck ring make the mallard drake easily recognizable. Photo by Vernon Craig.

Green Head—Late Season

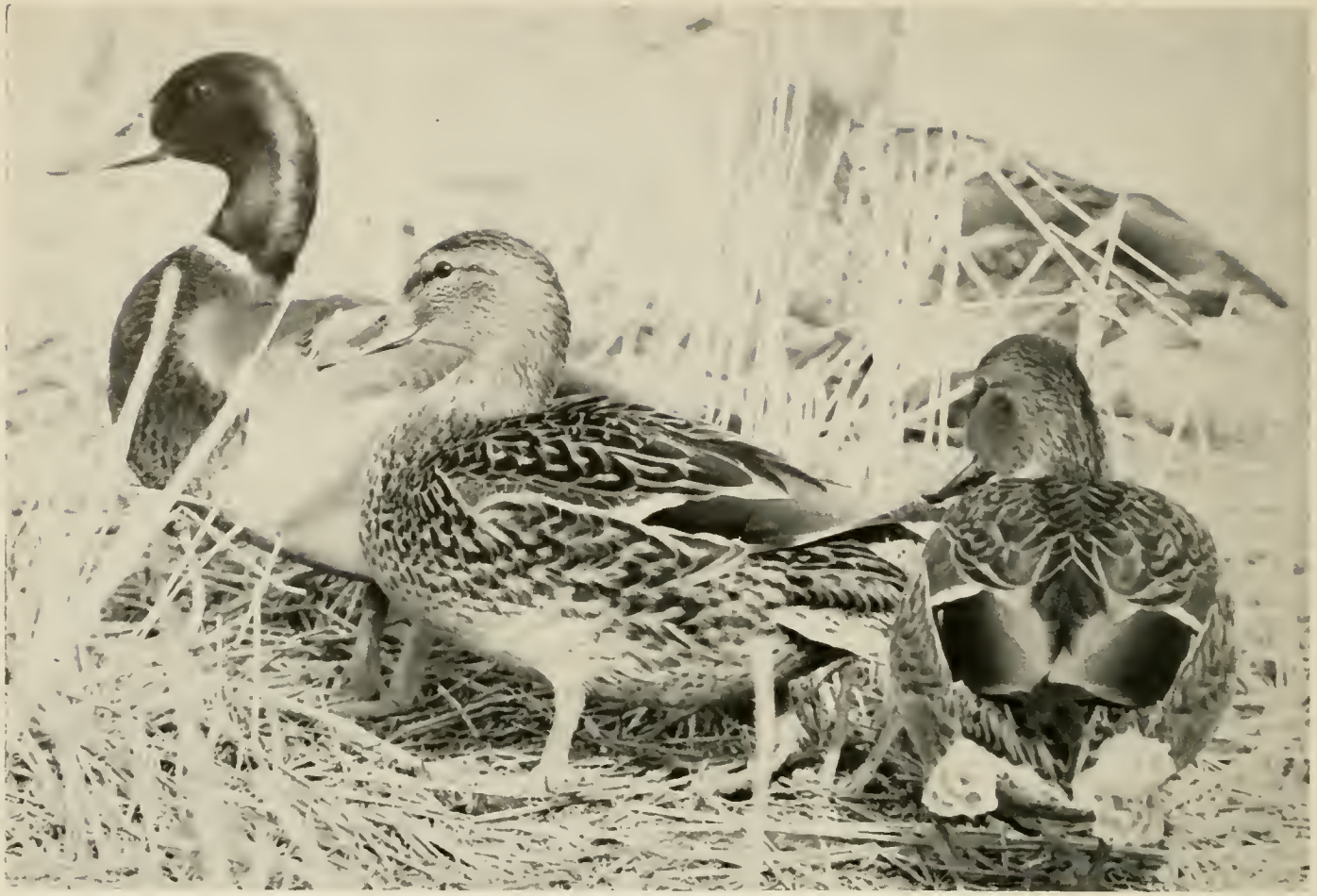
The beautiful mallard drake with his irridescent green head and olive bill is probably the most commonly recognized duck in North America. The mallard, probably the most plentiful of waterfowl, is known on every continent and is the ancestor of most of our domestic ducks. The female mallard is not so easily recognized as the male for she wears a less gaudy plumage of brown mottled feathers. Her bill is orange with dull brown spots.

This fine bird makes up a large part of the waterfowl hunter's bag in Montana as well as in other states. It is a very hardy species and many winter in Montana where open water is to be found. Their food is about 90 percent vegetable and 10 percent animal. Preferences are for a variety of fresh water plants including grasses, pondweed, sedge, and smartweed.

At one time, mallards were a prized item of market hunters. Before adequate laws were passed, it was not uncommon for one market hunter to kill from 6,000 to 8,000 mallards during one season. Government records show that during one fall and winter, at least 120,000 mallards were taken by market hunters in a small Kansas area.

Elimination of market hunting, setting bag limits, and establishment of hunting season were among the first efforts of managing waterfowl. Gradually, as more was learned about the birds and their movements, the theory of management by flyways evolved. In order to manage by flyways, certain boundaries had to be established for administrative purposes. It has been recognized, however, that flyway boundaries do not always coincide with the actual migratory patterns of birds and refinements must continuously be made to account for exceptions. A result of such an exception was the recent change in flyway boundaries so that more of Montana could be included in the Pacific Flyway. Another refinement now in the first phases of exeperimentation is a late mallard drake season to be held in parts of Montana, Wyoming, and Colorado.

Central Flyway duck hunters have, for the past several years,



Brightly colored drake mallard, background, is easily distinguished while in winter plumage from the rather drab, mottled brown mallard hen, foreground. Photo by Vernon Craig.

been held to tighter regulations than their neighbors to the west in the Pacific Flyway. The reasons are basically because of poorer production of ducks coupled with a highly efficient harvest of waterfowl, particularly of mallards, in the Central Flyway.

Game workers in states along the Continental Divide, backed by volumes of banding information, have insisted that the mallards along the east slopes of the Rockies do not join the main stream of Central Flyway migrants. Therefore, these particular birds, primarily mallards, get relatively little hunting pressure. Authorities of the U.S. Fish and Wildlife Service have therefore conceded to a trial late season on mallard drakes in parts of Montana, Wyoming and Colorado.

The special season will be for mallard drakes only from December 14 through January 5, 1969, in the Central Flyway portion of Montana. The Central Flyway part of Montana includes Blaine, Fergus, Judith Basin, Wheatland, Sweetgrass, Stillwater and Carbon counties, and all other counties lying east of these. Daily bag limit will be four and possession eight mallard drakes.

Hunters who want to take part in the hunt will be required to have a **free** permit from the Fish and Game Department in addition to regular license requirements. Permits will be available by correspondence or by personal request from all Fish and Game offices. Applicants need only give their names, full addresses and number of their Montana bird licenses. Permits will not be issued until after December 1.

This could be a real breakthrough for Montana duck hunters and if continued, will offer a lot more recreation to Central Flyway gunners. The future of such seasons may well depend upon the hunters' willingness to play the game by the rules. An experimental early season on teals was disappointingly discontinued, primarily because too many hunters were either unable to identify teal or used poor discretion in picking their targets. Hunters are urged to take part in the late mallard season and to hunt in a "sportsmanlike" manner, observing all rules of hunting and hunting etiquette.

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Edited by Vernon Craig

Wildlife Habitat and the Human Environment

GEORGE DARROW

A speech presented to the Billings Rod & Gun Club on Oct. 2, 1968, by George Darrow, State Representative, District 9, Yellowstone County, Montana.

Is there a relationship between wildlife habitat and the human environment?

I believe there is. One example might be the seasonal reenactment of the primeval nesting instinct. We all know that birds do this, but it is a coincidence that the record of real estate sales show that the annual peak of home buying comes in May?

What about the exploring impulse of the animal world? This is strongest in the last half of the summer, in August, after the strenuous initial effort of feeding and caring for the young can be relaxed. Exploring, with no other purpose than to satisfy their curiosity, is one of the strongest animal urges when time can be spared from the business of survival. How deeply rooted is our motivation to take an August vacation trip?

Or we might consider that many species of animals and birds, which spend the summer in widely dispersed family groups come together to spend the winter months in large herds and flocks. What ancient pattern are we following when we increase our group activities with the shorter days of autumn? Could it be that the members of organizations and social clubs are actually emulating the seasonal patterns of wildlife when they come together for the fall and winter activities of their groups? How strong is our kinship with the rest of nature?

Most of the time we talk of wildlife as something to be managed. With our human intelligence, we seek to assure the continued abundance of our native game and fish. Our management of wildlife habitat is directed toward maintaining high productivtiy and a sustained annual crop. Wildlife studies and research projects are designed to gain new knowledge which will contribute to improved management programs. Certainly this is important work, and I believe that we in Montana take pride in the fact that it is mostly well done.

But, in our preoccupation with managing wildlife, we have arrogantly presumed that our knowledge of these lesser creatures was useful to us only in **our** management of **their** habitat —our environment. We have been so self-centered in our human egotism that we ordinarily think of the other living organisms, with whom we share this planet, as mere objects to be manipulated however we see fit. We haven't really considered our urgent need to know **what they can teach us.** By comprehending the diverse patterns of animal behavior, can't we gain some useful insights into our human behavior?

It is appalling to think that our national emblem is on the verge of extinction. Photo by Gerry Atwell.

I would like to quote from a book entitled "Wild Heritage" by Sally Carrighar. She says, " . . . it is plain that in understanding animals we can see some of our own dangers and opportunities much more clearly. For animals' problems often parallel ours, and they solve them with such success, their lives in general follow such smooth courses, and their societies are so permanent, they work so well, that it seems not only interesting but helpful to realize that human beings have the same possibilities of living effectively."

Perhaps we have overlooked the most important reason for studying and conserving the wildlife with whom we share our air supply, water supply and food supply. Are we finally coming to understand that their well-being is ultimately interwoven with our own human well-being? Wildlife is important, certainly, for its own sake. It is also a valuable resource to be used. But of vastly greater significance, as its meaning to the continued health and well-being of the human species.

Is there really any way that we can separate wildlife habitat from the human habitat? Does our civilization and advanced technology really put us above the biological laws upon which all life depends? There is no doubt in my mind that "a good wildlife habitat is a livable human environment." The converse is equally important. An environment which is unfit for wildlife is equally unfit for human life.

Have you noticed that there seems to be fewer robins, fewer meadowlarks and songbirds in Montana cities than there were only a few years ago? I certainly haven't made any bird counts to verify this. Perhaps the Audobon Society has. If this casual observation were to be scientifically verified, shouldn't we be a little uneasy about what may be happening to the health of our own environment? Is this the cumulative effect or our individual use of DDT and other persistent insecticides in our own backyards?

I would suggest that the disastrous effect of DDT on the reproduction of birds, animals and fish is telling us something about the deteriorating health of our own environment. Perhaps we should recognize the value of wildlife to us as a sort of early warning system. I am concerned, as we all are, about the sterility of bald eagles' eggs which results from the concentration of DDT in the final links of the food chain. It is appalling to think that our national emblem is on the verge of extinction.

By destroying all wilderness environments, will we also destroy man's capability to live sanely in his civilized society? Photo by Bob Cooney.

But have you stopped to think what might happen if the bald eagle and other species weren't here to serve as environmental indicators? What might be the result if, all unknowing, we were to continue using DDT as we have in the past, for several human generations? What might have happened if we saturated our land and water with DDT for three or four generations? Might there come a day when the human species suddenly became aware that **it** was sterile?

DDT is only one of five or six hundred thousand synthetic chemicals which are on the market today. How much do we really know about the cumulative long-range impact which these chemicals or their complex combinations, have on our environment?

In another portion of our environment, our rivers and lakes, fish and other aquatic organisms also serve as sensitive environmental indicators. The best of our instrumentation and quality sampling techniques falls short of the sensitivity to contamination and pollution which these organisms possess. By their health or distress, by their presence or absence in the local environment, they will tell us far more and at much less expense than any water quality monitoring system we can devise.

Coal miners, in an earlier day, used to take canaries into the mines with them to warn when the air supply was getting con-

taminated by coal gas. When their canary began to droop, they knew that they had just enough time to get out of the tunnel and up to the surface. Are we awake to the cumulative environmental deterioration for which the species already extinct have sounded the alarm? Are we listening to the danger signals of further environmental deterioration which are sounding today from the species now endangered?

In 1851, Henry David Thoreau asserted at the Concord Lyceum that, "in Wildness is the preservation of the World." The profound implications of this terse fragment of ecological truth are yet ignored. Isn't it "wildness," the unique genetic heritage of each individual, which distinguishes living organisms from machines? Isn't it "wildness" that characterizes the aspirations of the human race for freedom of individual expression. When we do have the opportunity for that freedom can we really express ourselves without reflecting, in some manner or other, the "wild heritage" transmitted to us by eons of evolution?

When we hunt and fish, are we not in some way reenacting our ancestral past? Aldo Leopold once said, "all history consists of successive excursions from a single starting point to which man returns again and again to organize yet another search for a durable scale of values." As Americans have concentrated in even larger cities, the stronger the impulse to drive out to seek nature. And we find ourselves driving even longer distances to experience an interlude of peace, solitude and natural scenery. Is it a matter of concern that our pursuit of progress has often become, to our consternation, "actually a progressive dilution of the essentials by the trivialities of living"? (Aldo Leopold)

In closing, I would like to suggest that everyone interested in the conservation of wildlife is engaged in a cause of far-greater meaning than you perhaps have fully appreciated. Your programs and your actions in preserving and improving wildlife habitat may be of significant consequence for the health of the human environment. What you and others in the wildlife movement are doing today may have its most lasting significance in the contribution you are making to the future well-being of your children and even to the survival of future generations. It has been said that, "once you are aware of a problem, you cannot avoid the responsibility of doing something about it." I know that this group has assumed a share of environmental responsibility for many years. I hope that others can be pursuaded to join with you in the greater effort which lies ahead.

Identification Of Animals From Tissue Samples

By DR. JOHN JUTILA
Montana State University

Recently, a Montana game warden received a telephone call from a rancher who indicated that he had seen a pickup truck containing two men and bearing a bulky, canvass-covered cargo leaving a remote area known to contain abundant game. The next morning, the warden inspected the area and after a short search found evidence of a recent kill. Small bits of entrails, meat, hair and dried blood were collected, individually wrapped and immediately sent to Montana State University for laboratory analyses. From the rancher, the warden obtained more informatiton about the v e h i c l e which eventually led him to an address in a small town 12 miles from the presumptive site of poaching. An examination of the truck owned by one of the suspects revealed several spots of dark brown and red flaky material and scraps of meat scattered about the truck bed. Similar findings were made on the floor of the garage and on a meat saw found in the home. The warden proceeded to send the saw, tissue fragments and scrapings of the flaky material to the University for analysis.

Forty-eight hours after the specimens had been delivered to the laboratory, the warden was notified that all the material analyzed was identified as having been elk. The saw was also found to contain remnants of elk meat and blood. The confrontation of the suspects with this evidence quickly led to their admissions of guilt and subsequent arrests for violation of Montana game laws. Versions of this type of police work have occurred many times before and since, and demonstrate dramatically how law enforce-

ment officers, by taking advantage of new technological tools, develop a chain of evidence leading to the apprehension and prosecution of game law violators.

The Montana Fish and Game Department continues to be confronted with the difficult task of enforcing state game laws. An increasing population, increased outdoor recreational activities and greater mobility of outdoorsmen predispose to game law violations and greater difficulty in apprehending and prosecuting game law violators. Subsequently, there is an increasing need in the state devices and techniques to assist law enforcement officers in their tasks. One such method, recently developed at Montana State University, analyzes samples of flesh, blood or other animal material and determines from which species of animals they originate. The tests can be done quickly and are so reliable as to be acceptable evidence in court proceedings. The test employs the principal of a body's tendency toward natural immunity, and the subsequent production of protein molecules (antibodies) which fight invading germs or other materials that do not belong to the body.

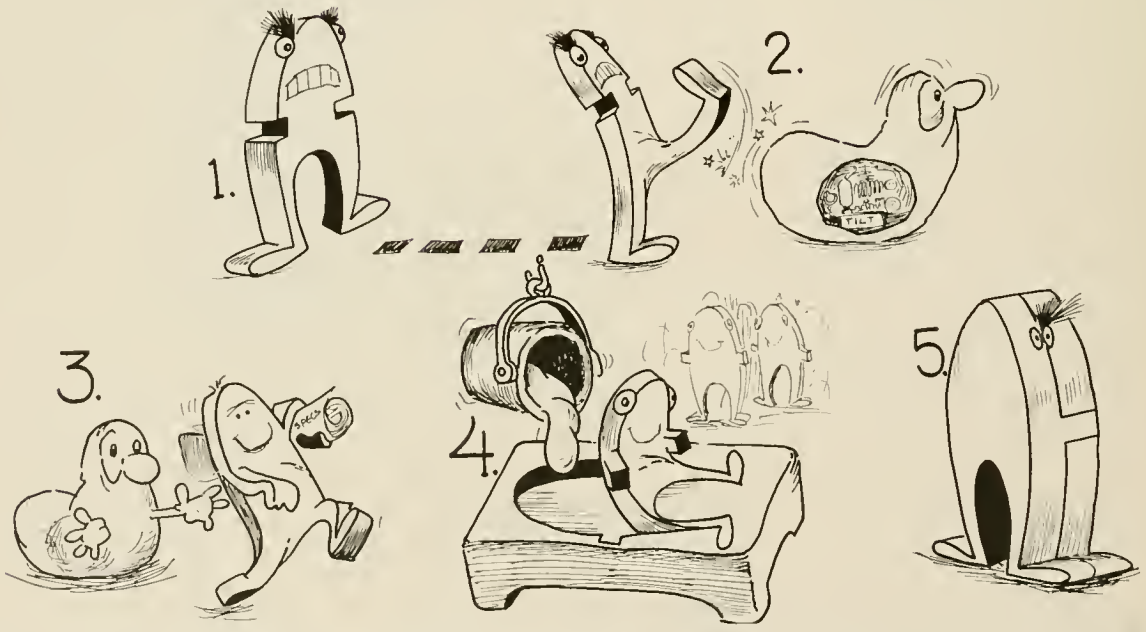
The liquid part of blood is called plasma. It is a watery material of highly complex composition. One of the composites, fibrin, aids in the clotting of blood. When fibrin has been removed from the plasma, the fluid is then called serum. The most effective means of identifying species from tissue or fluid samples involves testing certain properties of blood serum. Most criminal laboratories, for example, employ some methods for identifying blood specimens as well as sperm, organs, saliva, mucous, etc. The sensitivity of these tests was demonstrated when substances from 5,000 year old Egyptian mummy tissue was identified as to blood group.

As previously noted, the body has a mechanism for opposing foreign materials such as disease-causing virus. One part of this mechanism employs a version of fitting square pegs into square holes. Animal substances which enter the body contain various-shaped proteins known as antigens. These stimulate the invaded body to produce proteins of a shape which will interlock with the antigens. As keys are made to fit specific locks, different antibodies must be manufactured to fit different kinds of antigens. The major reason for vaccination of animals or man with a virus or bacterial vaccine is to produce antibodies which have as their functions the removal of disease-producing life forms that enter the body.

The first step in the process of identifying an animal by scraps of meat or blood is to produce a serum containing only antibodies which will lock onto, or fit into the antigens of only one species, say elk. Another antiserum must contain only antibodies which will lock only onto antigens of deer—another for beef, etc.

The antiserum can be successfully stored only under extreme cold. Currently, the serum bank at Montana State University contains antiserum directed against elk, deer, moose, antelope, bear, mountain goat, big horn sheep, cattle, domestic sheep and goats, horses, and swine.

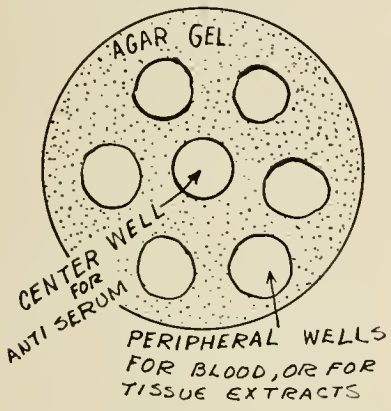
Blood and meat extracts of several animal species are typically used as **known** antigens and used to control the testing process. The unknown or field samples processed by several hours of extraction in water. Several flakes of dried blood approximating one drop of fluid blood are dissolved in nine drops of water while fresh blood is diluted 1:10 before use. Typically, blood specimens can be processed for testing within minutes because of their great solubility in water. Well-minced meat specimens are extracted in water for several hours prior to testing. The red to pink solution overlaying the sediment is then used for analysis. Fatty meat is commonly treated with a solvent which dissolves away the fat and allows the protein to be more readily extracted. Cooked meat presents problems since heat has a tenden-



1. Foreign antigen invades body. 2. Foreign antigen stimulates genetic coding device in nucleus of lymph cell. 3. Nucleus sends messenger molecule into protoplasm to form antibodies. Antibodies are formed. 5. Antibodies lock onto invading antigens.

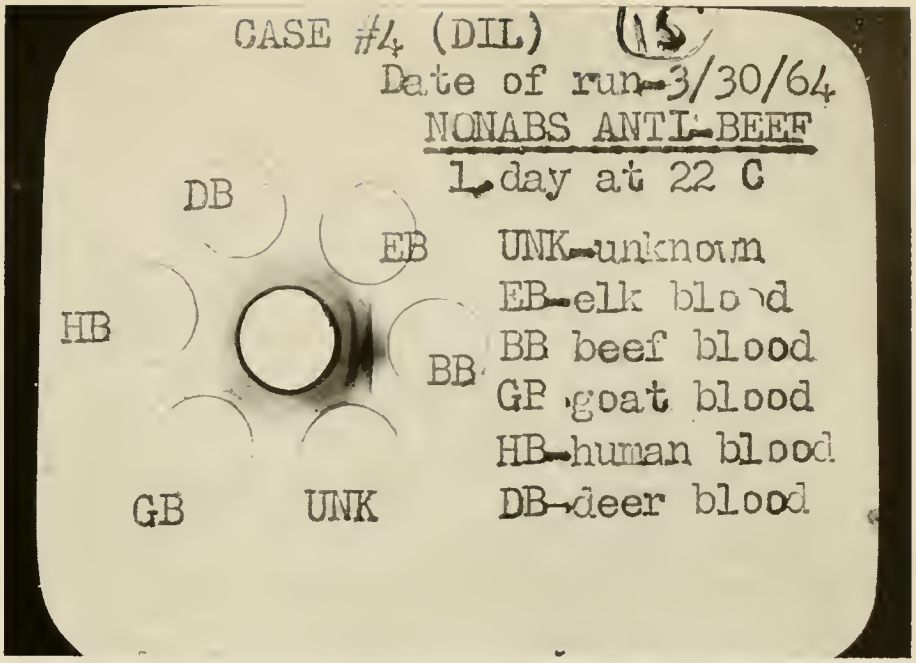
cy to make proteins highly insoluble. To overcome this problem, the meat is disrupted in a waring blender and extracted for at least 10 hours to release proteins.

The actual tests are done as follows—First a thin layer of a gelatinous material, (agar) made from seaweed, is put into a sterile petri dish and allowed to harden. When the agar has hardened into a thin film, a circular area is removed from the center of the film and from seven other spots around the center well.

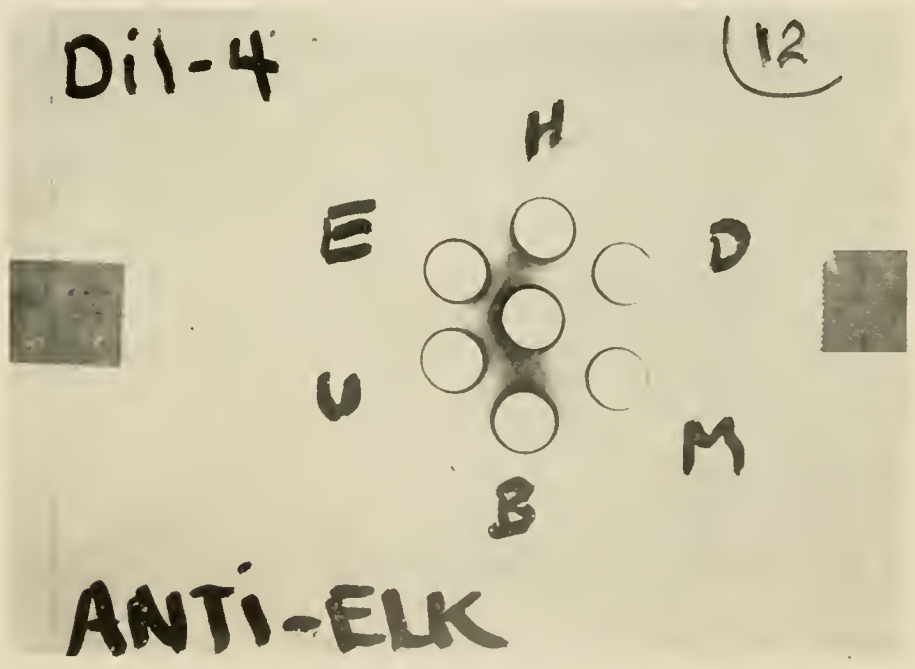


The center well is filled with prepared antiserum. For example, this particular preparation may get a drop of antiserum containing only elk antibodies. A drop of blood from the unknown source is placed into one of the outer wells. The remaining outer wells are filled with blood or tissue extract from known species of animals. The solutions in the wells diffuse toward each other in the agar much like ink diffuses through a blotter. As the antigen and antibody molecules encounter each other in the agar gel, they react in various ways. Moreover, different proteins in a complex mixture such as blood diffuse at different rates, depending on their sizes and shapes, leading to the development of separate and visible antigen-antibody reactions.

When the antibodies diffusing out from the center well meet antigens of the same species, a definite visible line is formed. For example, if our center well contains elk antibodies, and the unknown blood sample is from elk, then a line forming in the agar as illustrated would identify the sample as elk. Basically, this is caused by antibody proteins locking onto antigens, thus creating heavy protein structures. The antibodies of elk would not lock into



A typical but complex reaction between beef blood and anti-beef serum. There are at least six reaction lines which characterize the beef-anti-beef system and makes it relatively easy to identify unknown blood if beef proteins are present. Cross-reactions have occurred with elk and unknown blood proteins which are apparently related to those found in beef blood. Normally, antibodies which cross-react with blood proteins of another species are removed by a tedious absorption process.



A specific reaction between elk blood (E) and anti-elk serum in the center well. Note also that the reaction line continues between the unknown blood well and antiserum indicating that the sample is elk blood. No cross-reactions occurred in this system because the antiserum was cleaned of antibodies reacting with proteins of other animal species such as deer (D), moose (M), beef (B), humans (H).

antigens of other animals and therefore the telltale "reaction of identity" would not exist. It follows that several test dishes, each containing a different antibody serum, may be necessary to determine blood or other tissue extract of unknown origin.

This method of analysis promises to be an important tool not only for fish and game, but for other phases of law enforcement. The test is reliable, quick, comparatively easy to perform, and can utilize specimens of blood or other tissue fresh, dried, cooked, or even decomposing as well as mixtures of samples.

While much of the work has been developed by Dr. Jutila the system is now in confident application stage. The technique and materials have been transferred to the Montana Livestock Sanitary Board Diagnostic Laboratory at the Hadleigh Marsh Laboratories in Bozeman. Analyses and additional refinements will be made at this laboratory while developing an extensive "Bank" of various antiserums.

The state of specimen preservations is important, however, since bacteria tend to destroy antigens if they are held at room temperature and even more rapidly at higher temperatures. Specimens should be refrigerated immediately upon collection or, if this is not feasible, allow blood or tissue juices to dry on clean absorbent paper. These spots can be readily cut out and the dried material dissolved in water. Drying tends to preserve antigens for long periods of time and if kept in a cool, dry environment the material will yield positive results for years.

Extremely small quantities of material can be submitted for analysis particularly blood and body fluids. These fluids tend to be rich in antigenic material and remain relatively stable if handled properly. Small scraps of meat the size of sand grains will provide the laboratory with adequate amounts of antigenic material.

The system is limited by its inability to establish the age of the specimen, the age of the animal from which the specimen was derived and the sex of the animal. The latter problem will be solved rather easily since male animals possess distinctly different sex-related antigens, which should stimulate the production of antibodies in rabbits.

A very important attribute of the test is related to its ability to identify tissue antigens of a given animal species in mixtures of ground meat. Thus, with appropriate combinations of antiserum in analyzing hamburger, the laboratory worker is able to distinguish all the possible combinations of wild game and domestic animal meats included in the mixture.

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